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STAFF REPORT

PRICE TRANSMISSION BETWEEN THE U.S.
GULF PORTS AND FOREIGN FARM MARKETS

by
H. Christine Collins

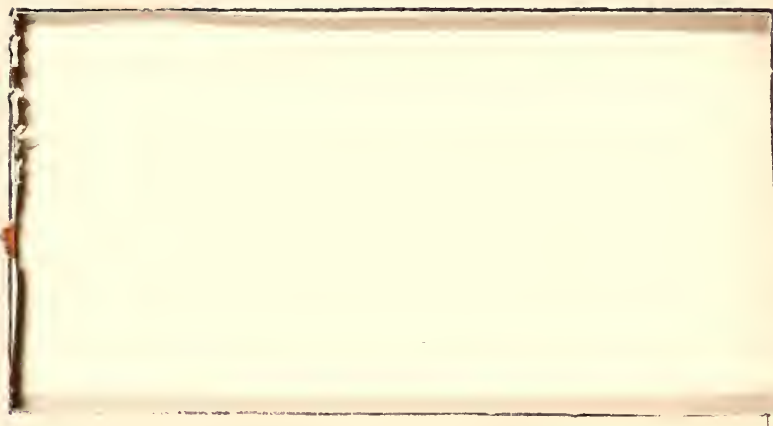
International Economics Division
Economics, Statistics, and
Cooperatives Service
U.S. Department of Agriculture
Washington, D.C. 20250

INTERNATIONAL ECONOMICS DIVISION



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ABSTRACT

Perfect price transmission is often used as a convenient simplification in models measuring elasticity of foreign demand. This paper employs the U. N. FAO data base of internal farm prices for wheat, corn, and soybeans in selected countries and the U.S. Gulf Ports price for these respective commodities as a measure of world price to show price transmission from the world market to the farm in these countries under several model specifications.

Key words: Price transmission; U.S. Gulf Ports price; foreign farm prices.

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PRICE TRANSMISSION BETWEEN THE U.S. GULF PORTS AND INTERNAL FOREIGN MARKETS

Introduction

In the early 1970's world prices for major agricultural commodities have risen drastically. The effect of price changes in the international market on internal farm prices is of interest from a theoretical standpoint and from the standpoint of policy making decisions. Bredahl, Meyers, and Collins (1) discussed these price changes through the global marketing system from a theoretical standpoint as price transmission. But the U.S. policy maker is concerned with which countries have wheat, corn, and soybean prices that move with international trade prices for whatever reason.

This article empirically supplements the Bredahl, et.al., (1) theoretical framework and shows the following relationships. The principal results of this article are listed below.

- o Of the nearly 50 wheat producing countries, about half have farm prices that move with the U.S. Gulf Ports price (the world price) (table 4). This is measured by a coefficient of determination (R^2) of .90-1.00.
- o This does not necessarily mean that free trade occurs between these 25 countries and the U.S., as evidenced by price and exchange rate transmission elasticities (table 8). The calculated elasticities would equal 1 under free trade assumptions of the basic theoretical model and the graphic presentation would be comparable to figure 1.
- o For wheat, Canada, Bolivia, Paraguay, and Uruguay have perfect price and exchange rate transmission between the U.S. Gulf Ports and their farm markets. Argentina, Australia, and Kenya also have price transmission, but in the past Argentina had a multiple exchange rate system to prevent exchange rate transmission.
- o Of the 49 countries surveyed, 27 had corn prices that moved with the U.S. Gulf Ports price.
- o Brazil, Thailand, Canada, Chad, Chile, and Tanzania however are the only countries whose farm prices are an extension of the world market price. Australia, Argentina, Korea, Philippines, Rwanda, Spain, Turkey, Pakistan, Zaire, and Morocco have perfect price transmission but exchange rate changes have not been transmitted to the farm level. Spain has farm level corn prices that are well above the world market price and Argentina also has a multiple exchange rate scheme for corn.
- o Fifteen out of 18 soybean producing countries had producer prices that changed with the U.S. export price.

- o Brazil and Paraguay, however, are the only countries with perfect exchange rate and price transmission. Canada, Japan, Nigeria, and Philippines show price transmission but there are other factors influencing their farm level soybean price. Japan is notable for the extremely high level of its support price for soybeans.
- o Most other countries have some form of price protection for their wheat, corn, and soybean producers. The European Community's Common Agricultural Policy for grains is the most notable. Mexico's flour mills and feed compounders are paid a subsidy by the government to offset high producer prices. India's government is the country's largest single buyer of grain and has a guaranteed price to the producer. Brazil sets its farm price for wheat at a very high level. Mexico's, India's, and Brazil's farm prices are keyed off the U.S. Gulf Ports price while the European Community internal farm prices for the most part generally are not.
- o The level of price and exchange rate transmission among countries runs the gamut from no transmission to full transmission.

In a recent article, Bredahl, Meyers, and Collins (1) went into considerable detail on discussing the point that "a key question that must be resolved in evaluating the elasticity of export demand is the size of the adjustment of foreign internal prices to U.S. prices" ..., i.e., price transmission.

The generalized price linkage between the exporting country's export price and the importing country's farm price is shown in Figure 1.

The equilibrium prices and quantities in the importing country and exporting international markets are shown in broken lines where there are no subsidies or export duties. In their discussion, Bredahl, Meyers, and Collins referred to the models for the elasticity of foreign demand set forth by Tweeten (3) and Johnson (4). Tweeten's model is an excess demand model. His derivation of the elasticity of foreign demand for a commodity includes coefficients for the elasticities of domestic demand and supply in a given country, which respectively are weighted by the ratio of the quantity supplied or demanded to the level of imports of that commodity. The elasticity of price transmission i.e., E , the response of the given country's price to changes in the world price is also included in his formulation as a bridge between the world price and the country's internal prices. A similar relationship is used by Johnson. Johnson, however, states, " E is set equal to 1.0 and can be ignored." Bredahl, Meyers, and Collins in contrast conclude that Johnson's assumption of perfect price transmission is a convenient simplification, but has a profound impact on the calculated elasticities and raises serious questions about their applicability to the real world.

This paper concentrates on calculation of the magnitude of the elasticity of price transmission between the U.S. Gulf Ports and internal markets in selected countries under several model specification, empirically supplementing the Bredahl, Meyers, and Collins paper on the subject.

This paper employs the U. N. Food and Agriculture Organization (FAO) data base (2) of internal farm prices for wheat, corn, and soybeans in selected countries and the U.S. Gulf Ports price for these commodities as a measure of world price (6).

The results are expected to show a price transmission elasticity bounded by zero and one. In the classical free trade model with zero transfer cost, U.S. and foreign prices would be equal. In this case, the price transmission elasticity would equal one. The price transmission elasticity, also, will be one if the foreign price varies proportionally with the U.S. price.

A price transmission elasticity of one may be termed perfect price transmission. In cases where governments insulate internal producer prices from world market prices (with variable import levies, subsidies or quotas), the price transmission elasticity will be at or near zero.

A recent complication to the transmission of the U.S. export prices to internal farm prices in foreign countries has been the shift in exchange rates vis-a-vis the dollar for many countries. Colombia, Korea, Pakistan, Israel, Yugoslavia, Zaire, the Philippines, Argentina, Bolivia, Chile, Costa Rica, and Brazil are countries whose exchange rates vis-a-vis the dollar shifted so drastically that their internal prices must be converted to a common currency to unmask the existing price relations. Argentina and Brazil had official exchange rates changing in magnitudes of 13 and 11 times during the respective periods of 1966-75 and 1963-73. Colombia and Korea, (1963-74) and Zaire (1966-75) had exchange rates changing in the magnitude of 3 times. However, there are also many countries including Mexico and the Dominican Republic whose exchange rates did not change vis-a-vis the dollar during those years (table 1).

If there is perfect transmission of the exchange rate influence then a price transmission elasticity of one would include the condition that the elasticity of a foreign internal price with respect to the foreign currency/U.S. dollar exchange rate also equals one.

Empirical Models

To test Bredahl, Meyers, and Collins, Tweeten's and Johnson's theoretical specifications, this author has developed the following general models to test the relationship between the U.S. Gulf Ports price and domestic producer price for corn, wheat, and soybeans.

The model specifications for each country considered are as follows:

- 4
→ note
- (1) $P_{\text{country A}} = a + b P_{\text{GP}}$
 - (2) $P_{\text{country A}} = a + b P_{\text{GP}} (\text{EXR})$
 - (3) $\log P_{\text{country A}} = a + b \log (P_{\text{GP}})$
 - (4) $\log P_{\text{country A}} = a + b \log P_{\text{GP}} (\text{EXR})$
 - (5) $\log P_{\text{country A}} = a + b \log (P_{\text{GP}}) + b_2 \log (\text{EXR})$

where $P_{\text{country A}}$ is the internal farm price expressed in the currency of the country under consideration; P_{GP} is U.S. Gulf Ports price for the commodity; EXR is the exchange rate between the U.S. dollar and the country's currency.

Each of these specifications assumes particular characteristics in the price relationships. Each specification also portrays the presence of perfect price transmission in a specific way. Model 1 assumes a constant transportation margin between the U.S. Gulf Ports and the country under consideration and assumes a constant exchange rate between U.S. dollars and the country's currency. The coefficient on the Gulf Ports price variable should not be significantly different from the exchange rate under perfect price transmission. Model 2 assumes a constant transportation margin between U.S. Gulf Ports and country A and allows for exchange rate shifts. However, this model does assume perfect transmission of the exchange rate through the marketing system. Since the Gulf Ports price has been converted to the country's currency, the coefficient on the Gulf Ports price variable should not be significantly different from 1 under perfect price transmission. Model 3 assumes a constant percentage margin between the Gulf Ports and the internal price and no change in the exchange rate. The coefficient on the Gulf Ports price again is an elasticity of price transmission. Model 4 also assumes constant percentage margins between the Gulf Ports price and the country's internal price and the same exchange rate and price transmission. The Gulf Ports price is converted to the country's currency, and the coefficient on that price again is an elasticity of price transmission. Model 5 assumes a constant percentage margin between the U.S. Gulf Ports and country A. This model is specified to study transmission of prices and exchange rates through the marketing system, since the coefficients on the Gulf Ports price variable and the exchange rate variable are the elasticities of transmission.

These models were tested assuming (1) internal farm prices changed in the same year as the U.S. Gulf Ports price and (2) internal farm prices changed a year later. Lagged price variables were chosen when they provided a better statistical fit than the unlagged price variables.

The major criterion for choosing the appropriate model to report for each country was whether the exchange rate coefficient was significantly different from zero in a double logarithmic specification as in model 5. Even though models 3, 4, and 5 should present approximately the same results, model 5 was chosen because it allows one to isolate the effect of exchange rate changes on prices. The resulting coefficients on the exchange rate and Gulf Ports price were tested to determine if they are significantly different from zero. This is a test of whether a definite relationship exists between the Gulf Ports price and foreign internal farm prices. The coefficients were also tested on their equality with 1, the condition for price effects being perfectly transmitted through the marketing system.

Where the exchange rate coefficient was not significantly different from zero, the simple linear model 1 was chosen. The same models were also used on wheat and soybeans.

Estimation Results for Corn

The equations estimating the relationship between the U.S. Gulf Ports price and the various country prices are given in table 2.

The list of countries is divided into three groups. The first group includes those countries whose prices move with the U.S. Gulf Ports price (i.e., those with R^2 corrected for degrees of freedom of .90 and above); those that roughly follow the U.S. Gulf Ports prices (i.e., with coefficients of determination of .80 to .90); and those countries whose internal corn prices have little or no relation to the U.S. Gulf Ports prices. The author has arbitrarily defined this group as those with coefficients of determination of less than .80.

Nearly half of the countries surveyed had internal farm prices that were closely linked with the U.S. Gulf Ports corn price in that the coefficient of determination was at or near 1.0 (table 4). Mexico, Canada, Egypt, Tanzania, and Chad, and major corn exporters South Africa and Thailand had corn prices that changed with the U.S. Gulf Ports price by this criterion. The group includes countries whose exchange rate with the U.S. dollar have stayed nearly constant during the years under consideration.

When exchange rates were deemed appropriate as an explanatory variable, another 15 countries had internal farm prices that were highly related to the U.S. Gulf Ports price; Argentina, Brazil, and the Philippines were included in this group.

However, from the estimated regressions, only a few countries appear to meet the classical free market conditions of perfect price and exchange rate transmission. Under these conditions, in the double logarithmic functions the coefficients on the price variable and exchange rate variable are not significantly different from one .5.

(tables 5 - 7). Thailand, Tanzania, Brazil, Canada, Chad, and Chile fit this statistical requirement entirely. Perfect price transmission (but not exchange rate transmission) also occurred between the U.S. Gulf Ports price and internal farm prices in Argentina, Australia, Colombia, Costa Rica, Egypt, Italy, Korea, Pakistan, Philippines, Rwanda, and Turkey (table 8). Additional countries also appear to meet the requirements for price transmission when linear functions are used. Either the coefficient on the Gulf Ports price in dollars is not significantly different from the country currency dollar exchange rate or the coefficient on the Gulf Ports price in the country currency is not significantly different from 1. Argentina, Colombia, Costa Rica, Egypt, Korea, Spain, Venezuela, and Yugoslavia have internal farm prices that statistically fit these criteria.

Thus, the world's major corn exporters including Argentina, Brazil, and Thailand are a few of the countries whose internal farm prices are linked to the Gulf Ports price by statistically perfect price transmission. South Africa, a major corn exporter and Mexico, have prices pegged to the U.S. Gulf Ports price but each has marketing schemes to prevent full price transmission (Appendix table 9 summarizes these countries' farm price policies). Some countries, such as Yugoslavia, appear to set their internal farm prices in accordance with the Gulf Ports price, but one year later (table 2).

Countries of the European Community, including France (a major corn exporter), have a sufficiently protected market so that the relationship between the Gulf Ports price and their internal farm price is somewhat weakened. Many of the less developed countries also have price controls on corn. Other countries have internal corn prices going in different directions from the Gulf Ports price because they neither import or export corn, and thus, have little interest in the international market.

Table 3 shows that exchange rate changes have an impact on internal farm prices for many countries. Nevertheless, there are only a few countries that have statistically had perfect exchange rate transmission. Bolivia, Brazil, Chile, Colombia, Sri Lanka, and Niger are some of the countries who have had some of the most extreme changes in dollar country currency exchange rates, and have had exchange rate transmission. It is well known, in contrast, that Argentina has had a multiple exchange rate system, geared to specific agricultural export commodities, to prevent exchange rate transmission.

Bredahl, et.al., (1) define the price transmission elasticity as being either at 0 or 1. This article, however, points out that these elasticities cover the full range from zero to one (table 8). While Bredahl, et. al., imply that the price transmission elasticity for corn is zero for the EC, the elasticities calculated here range from .043 in West Germany to .674 in Italy. For Argentina, they set the elasticity at 0, whereas results have indicated an elasticity of 1.115. For South Africa, they indicate at elasticity of 0, these calculations show .426. Thailand and Brazil have calculated price transmission elasticities of .722 and 1.101, respectively, rather than zero from their study (table 8).

Estimation Results for Wheat

The equations estimating the relationship between the U.S. Gulf Ports price for wheat and the various country prices are given in table 12.

From the list of countries grouped according to the strength of the relationship, given in table 13, more than half of the countries surveyed had internal farm prices that were closely linked with the U.S. Gulf Ports price in that the coefficient of determination was at or near 1.0 from either Model 1 or Model 5. India, Norway, Canada, Australia, Greece, Paraguay, and Mexico had wheat prices directly linked to the U.S. Gulf Ports price where the coefficient of determination was at or near 1.0, when no consideration is given to exchange rates. This group again includes countries whose exchange rates with the U.S. dollar have stayed nearly constant during the years under consideration. When exchange rates were taken into account another 20 countries have internal farm prices that are highly related to the U.S. Gulf Ports price; Argentina and Brazil were included in this group.

While there is a strong relationship between these countries' internal farm prices and the world price, there is not always the full price transmission expected from free market conditions. From the estimated equations, only a few countries appear to meet the full condition of price and exchange rate transmission in the double logarithmic functions where the coefficients on the price variable and exchange rate variable are not significantly different from 1. Canada, Uruguay, Bolivia, and Paraguay are the few countries that fit this statistical requirement. While Canada has marketing systems that pay growers initial payments and final payments based on a pooling system, Canada is so involved in international trade the world market price is an integral part of their pricing scheme.

Perfect price transmission (but not exchange rate transmission) also appeared to occur between the U.S. Gulf Ports price and internal farm prices in Australia, Argentina, Brazil, Israel, and Kenya. Japan, Chad, and Korea also appear to meet the requirements for price transmission when linear functions are considered. Either the coefficient on the Gulf Ports price in dollars is not significantly different from the country currency/dollar exchange rate or the coefficient on the Gulf Ports price in the country currency is not significantly different from 1. Brazil and Japan, however, are countries that set their farm prices for wheat at a level well above the world market price, but it may be that the price is set by policymakers in accordance with the world price but at a fixed margin above that price (tables 14 - 16).

Producers of wheat in most producing countries are protected from competition by domestic price supports. As a result, full price transmission occurs only for a few countries. The Gulf Ports price, however, is often used as a guideline price and more than half of the countries surveyed appeared to set their internal farm prices in accordance with the Gulf Ports price, but one year later.

The world's major wheat exporters, including Canada and Australia, are a few of the countries where price transmission occurs from the Gulf Ports price to their internal farm prices. Argentina also has internal farm prices linked to the U.S. Gulf Ports price, but has had a multiple exchange rate scheme that prevented full transmission of the exchange rate changes. Mexico has had prices pegged to the U.S. Gulf Ports price, but has marketing schemes through subsidy programs to flour mills to prevent full price transmission.

Although, the European Community is well known for its threshold price system, the degree of price transmission appears to diverge among member countries. West Germany has been known for its historically high grain prices in a protected market that existed well before the inception of the European Community's Common Agricultural Policy. In contrast, Italy's farm wheat prices have been more closely linked with the Gulf Ports price (i.e., high coefficient of determination). Belgium and the Netherlands have internal farm prices only intermediately related to the Gulf Ports price. Because of the Common Agricultural Policy and the threshold price system, however, there is no direct price transmission for any of the EC member countries (where the elasticity of price transmission is at or near 1.0).

Estimation Results for Soybeans

The equations estimating the relationship between the U.S. Gulf Ports price and the various country prices are given in table 17.

From the list of countries grouped according to the strength of the relationship given in table 18, 15 of 18 countries surveyed had internal farm prices that were closely linked with the U.S. Gulf Ports price because of their high coefficients of determination. Ecuador, Paraguay, Mexico, Nigeria, and the Malaysian Peninsula all had internal soybean prices highly linked with the U.S. Gulf Ports price in this way.

When exchange rates are deemed appropriate as an explanatory variable, another large group of countries have internal farm prices that are highly related to the U.S. Gulf Ports price. Our next largest competitor, Brazil, is included in this group.

Many of these countries appear to have time lags in setting internal soybean prices. Colombia, Ecuador, El Salvador, Italy, Korea, Paraguay, Rwanda, Sri Lanka, and Yugoslavia have internal prices highly related to the lagged U.S. Gulf Ports price, indicating that these countries require a period of time to adjust to world price changes.

The international soybean market has the reputation of being a freer market than the international grains market. Comparing the estimated price equations for soybeans with those for grains indicates this may not be so. Only Brazil and Paraguay appear to meet the full condition of price and exchange rate transmission in the double logarithmic function where the coefficients on the price variable and exchange rate variable are not

significantly different from 1. There are several complications. The U.S., Brazil, and China produce the bulk of the world's soybeans with many countries regarding their soybean industry as an infant industry to be protected. Moreover, in many countries, particularly the Far East, soybeans are regarded as a higher value food crop than in the U.S., where they are valued in accordance with their oil and meal prices (table 19).

Subsequent research on wheat and corn prices substantiate the price relationships based on FAO data. The Commission of the European Communities July 1979 special publication, Agricultural Markets, Price Received by Farmers, Unit Values provides prices through the 1977/78 crop year. For the crop years 1966/67-1977/78, Greece, France, Norway, Denmark, Ireland, and Italy have farm level wheat prices that move with the U.S. Gulf Ports price, when measured by the coefficient of determination. Netherlands, Ireland, Italy, United Kingdom, and Greece also have exchange rates changes that have had a statistically significant impact on internal farm prices. None of these countries, however, have perfect price and exchange rate transmission. But the Netherlands shows perfect exchange rate transmission for wheat (table 20). The basic relationship also hold for corn despite the differences in data sources and updated time periods.

Conclusion

The U.S. Gulf Ports prices for wheat, corn, and soybeans are often used as indications of world prices for these commodities. Using farm prices for these commodities published by the U. N. Food and Agriculture Organization, this article statistically indicates that internal farm prices in many countries have moved with the world price.

Some countries' farm prices have changed with the Gulf Ports price because those countries really are involved in the international market with little or no restrictions. Other countries have policymakers who use the Gulf Ports price as a benchmark for setting their own internal prices. Still, other countries have internal farm prices that show little relation to the Gulf Ports price because of trade restrictions that protect internal markets.

Statistically 18 countries studied met the economic conditions of transmission of the corn price, and usually these countries fall within the group whose price equations have quite high coefficients of determination ($R < .80$).

For wheat, in contrast, only a few countries statistically meet the free market conditions of price transmission which fits in with the realities of price support programs in most countries. Nevertheless, nearly two-thirds of the countries studied had price equations with high coefficients of determination.

For soybeans also, only a few countries meet the free market economic conditions, despite the large number of countries whose price equations have quite high coefficients of determination.

Part of this is due to the protection afforded soybean industries in some countries. In other cases, processed soybeans are used as food and thus command a higher price than soybean meal for livestock feed.

For all of these commodities, the major exporters especially showed price transmission from the world market back to their internal farm markets. For corn, major exporters as Argentina, Brazil, and Thailand were such countries. For wheat, Canada and Australia; and for soybeans, Brazil showed direct price transmission.

In recent years, changes in international exchange rates have also had to be taken into consideration to show the price linkages that exist between the country's internal farm prices and the Gulf Ports price. The transmission of the monetary exchange rate appears to depend on whether the exchange rate published in International Financial Statistics really applies to the marketing of wheat, corn and sorghum. Most countries who have had extreme exchange rate changes vis-a-vis the dollar have had perfect exchange rate transmission. Multiple exchange rates or other trade barriers may not permit full exchange rate transmission, even when the IMF published exchange rates have shifted drastically. Transmission of the exchange rate effect, however, appears to be independent of the relationships between the internal farm price and the U.S. Gulf Ports price since there is little correlation between the internal price change and changes on the exchange rate. Exchange rate impacts only be of importance in a supply/demand relationship only if exchange rates impact on prices paid or received. This indicates those countries where exchange rate shifts have had an impact.

Finally, this paper demonstrates that when the world price for these major commodities does change drastically, there are direct price changes to the farm level in many producing countries.

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Figure 1--Generalized foreign trade model

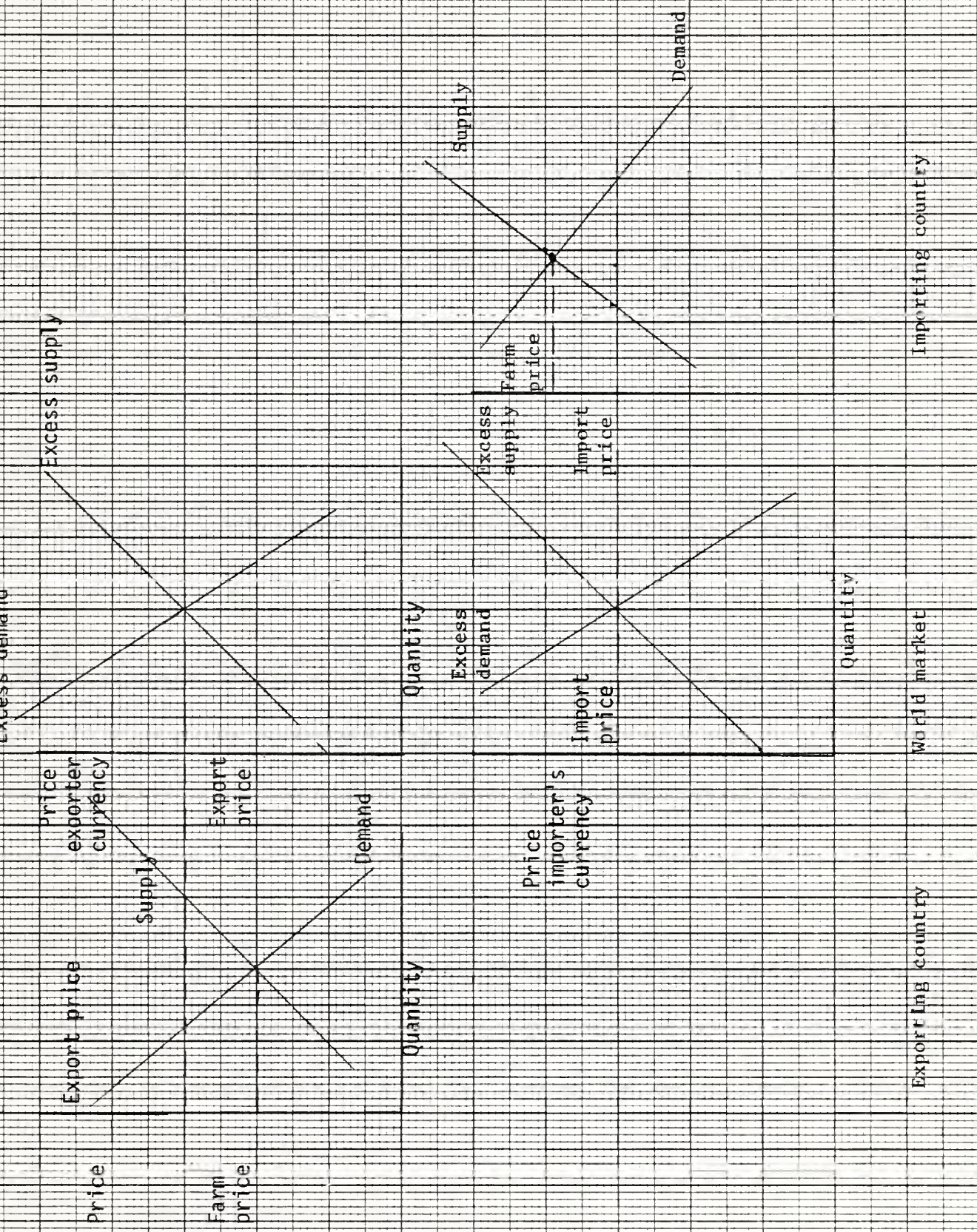


Table 1--Grouping of countries according to changes in currency/dollar exchange rate specific time period

Change of over 100 percent	Change of 20-100 percent	Change of 10-20 percent	Change of 0-10 percent	No change
Argentina	: Austria	: Algeria	: Canada	: Dominican Republic
Brazil	: Belgium	: Australia	: Cyprus	: Ecuador
Chile	: Bolivia	: Chad	: France	: El Salvador
Colombia	: Guyana	: Congo	: Italy	: Guatemala
Israel	: India	: Costa Rica	: Gabon	: Liberia
Korea	: Indonesia	: Denmark	: New Zealand	: Mexico
Pakistan	: Ireland	: Egypt	: Niger	: Paraguay
Zaire	: Japan	: Kenya	: Nigeria	: Tanzania
	: Korea	: Malawi	: Rwanda	
	: Malaysian Peninsula	: Morocco	: South Africa	
	: Netherlands	: Nigeria	: Spain	
	: Norway	: Portugal	: Thailand	
	: Philippines	: Sierra Leone	: Venezuela	
	: Rwanda	: Trinidad	: Zambia	
	: Sri Lanka	: Upper Volta		
	: Sweden	: Uruguay		
	: Switzerland			
	: Turkey			
	: West Germany			
	: Yugoslavia			

Model I	var	lag	:	:	variable	:	:	of freedom	:	regression	:	text
Austria	:Shillings/m.t.	:1963-75	:	:	1959.19 + 5.329 corn GP lag**	:	:	.738	:	90.894	:	2.549
Canada	: \$ Can./m.t.	:1966-74	:	:	.644 + .964 corn GP**	:	:	.923	:	.080	:	2.041
Chad	:Francs/m.t.	:1966-75	:	:	1913.66 + 241.557 corn GP**	:	:	.972	:	1,197.59	:	2.128
Congo	:Francs/m.t.	:1966-75	:	:	5757.51 + 190.36 corn GP**	:	:	.804	:	3,322.41	:	2.003
Czechoslovakia	:Koruna/m.t.	:1966-75	:	:	1734.62 + .587 corn GP**	:	:	.691	:	67.265	:	1.858
Dominican Republic	:Pesos/m.t.	:1966-75	:	:	1603.92 + 1.063 corn GP**	:	:	.918	:	1,053.64	:	2.184
Egypt	:Pound/m.t.	:1966-75	:	:	20.290 + .243 corn GP**	:	:	.941	:	1.966	:	1.665
El Salvador	:Colonos/m.t.	:1966-75	:	:	178.811 + .159 corn GP**	:	:	.033	:	14.218	:	1.513
Gabon	:Francs/m.t.	:1966-74	:	:	13967.8 + 48.031 corn GP**	:	:	.863	:	739.677	:	2.361
West Germany	:D.M./m.t.	:1966-75	:	:	260.213 + 1.998 corn GP lag**	:	:	.758	:	16.585	:	1.773
Guyana	:Guyana/m.t.	:1963-74	:	:	26.862 + 1.908 corn GP**	:	:	.940	:	13.055	:	1.566
Greece	:Dracuma/m.t.	:1963-74	:	:	1331.55 + 25.281 corn GP**	:	:	.964	:	137.736	:	2.470
Hungary	:Forints/m.t.	:1963-75	:	:	4220.42 - 10.015 corn GP**	:	:	.239	:	487.110	:	1.872
India	:Rupees/m.t.	:1966-74	:	:	112.948 + 9.812 corn GP**	:	:	.924	:	83.482	:	2.174
Iraq	:Dinars/m.t.	:1966-74	:	:	22663.7 + 170.505 corn GP**	:	:	.282	:	6,632.05	:	1.243
Italy	:Lire/m.t.	:1963-74	:	:	79154.8 + 334.985 corn GP**	:	:	.904	:	5,740.05	:	2.162
Malawi	:Kwachi/m.t.	:1963-74	:	:	2023.52 + 17.477 corn GP**	:	:	.633	:	349.606	:	1.973
Mexico	:Pesos/m.t.	:1963-74	:	:	728.272 + 3.429 corn GP**	:	:	.905	:	30.939	:	1.786
Morocco	:Durhams/m.t.	:1963-74	:	:	-24.172 + 5.633 corn GP**	:	:	.862	:	59.917	:	1.643
Netherlands	:Gullders/m.t.	:1966-74	:	:	272.402 + .299 corn GP**	:	:	.657	:	9.001	:	2.057
New Zealand	: \$ Nz/m.t.	:1966-74	:	:	3490.03 + 39.713 corn GP**	:	:	.685	:	944.349	:	1.681
Niger	:Francs/m.t.	:1963-74	:	:	3037.15 + 228.153 corn GP**	:	:	.901	:	2,137.270	:	1.607
Nigeria	:Nair/m.t.	:1966-75	:	:	32.262 + .868 corn GP lag**	:	:	.814	:	14.701	:	1.831
Paraguay	:Guarani/m.t.	:1963-74	:	:	1852.63 + 72.094 corn GP**	:	:	.819	:	908.501	:	1.566
Portugal	:Escudos/m.t.	:1963-74	:	:	759.159 + 31.840 corn GP lag**	:	:	.862	:	168.744	:	1.953
Reunion	:Francs/m.t.	:1966-74	:	:	23980.1 + 222.536 corn GP**	:	:	.838	:	3,265.36	:	2.210
Rhodesia	: \$ Rhod/m.t.	:1966-74	:	:	3131.53 + 7.651 corn GP**	:	:	.408	:	268.035	:	2.081
Sierra Leone	:Leone/m.t.	:1966-74	:	:	2383.71 + 17.001 corn GP**	:	:	.880	:	203.895	:	1.862
South Africa	:Rand/m.t.	:1966-75	:	:	2507.63 + 22.987 corn GP lag**	:	:	.954	:	142.268	:	2.366
Switzerland	:Francs/m.t.	:1963-75	:	:	230.425 + 2.973 corn GP**	:	:	.919	:	26.010	:	2.148
Tanzania	:Shillings/m.t.	:1966-74	:	:	-29.039 + 5.366 corn GP lag**	:	:	.914	:	24.924	:	1.715
Thailand	:Boht/m.t.	:1966-74	:	:	-28.802 + 15.210 corn GP**	:	:	.945	:	108.911	:	1.616
Trinidad	: \$ Trin/m.t.	:1966-74	:	:	315.994 + 1.547 corn GP**	:	:	.229	:	82.197	:	1.789
Turkey	:Lire/m.t.	:1966-74	:	:	8.818 + 16.304 corn GP**	:	:	.951	:	110.418	:	2.283

Country	UNIT OF dependent variable	TIME per lod	Equations	dependent variable	for degrees of freedom	error of regression	Watson test
Uganda	: Shillings/m.t.	: 1966-75	-43.428 + 4.758 corn GP lag**	: Dol./m.t.	: .804	33.262	2.014
Upper Volta	: Francs/m.t.	: 1966-76	15016.0 + 44.358 corn GP lag**	: Dol./m.t.	: .530	1390.280	2.036
Venezuela	: Bolivares/m.t.	: 1966-75	177.022 + 3.940 corn GP lag**	: Dol./m.t.	: .973	19.524	1.584
Zambia	: Ngwee/m.t.	: 1966-75	2859.92 + 29.971 corn GP lag**	: Dol./m.t.	: .926	263.699	2.322
Model 2							
Costa Rica	: Colones/m.t.	: 1963-74	145.710 + .958 EXR.corn GP**	: Dol./m.t.	: .905	66.763	1.928
Indonesia	: Rupees/m.t.	: 1963-74	13060.7 + 156.097 EXR.corn GP**	: Dol./m.t.	: .850	3415.48	2.469
Korea	: Won/m.t.	: 1963-74	10132.3 + 1.087 EXR.corn GP**	: Dol./m.t.	: .917	4195.30	1.913
Sri Lanka	: Rupees/m.t.	: 1966-74	-610.626 + 3.606 EXR.corn GP**	: Dol./m.t.	: .954	93.114	2.278
Model 5							
Argentina	: Pesos/m.t.	: 1966-75	-.085 + .453 log EXR* + 1.115 log corn GP**	: Dol./m.t.; Pesos/dol.	: .960	.160	2.216
Australia	: \$Aus./m.t.	: 1966-76	.278 + .975 log corn GP** - 1.643 log EXR**	: Dol./m.t.; Aus./dol.	: .911	.786	
Bolivia	: Pesos/m.t.	: 1963-74	4.526 + .604 log EXR** + .205 log corn GP	: Dol./m.t.; Pesos/dol.	: .986	.264	2.416
Brazil	: Cruzeiros/m.t.	: 1963-73	.277 + .782 log corn GP** + 1.01 log EXR**	: Dol./m.t.; Cruzeiros/dol.	: .969	.121	2.140
Chile	: Pesos/m.t.	: 1963-74	8.778 + 1.000 log EXR** + .594 log corn GP**	: Dol./m.t.; Pesos/dol.	: .993	.158	1.997
Colombia	: Pesos/m.t.	: 1963-74	2.489 + .811 log EXR** + .626 log corn GP**	: Dol./m.t.; Pesos/dol.	: .916	.130	1.454
France	: Francs/m.t.	: 1963-74	2.728 + .735 log EXR** + .520 log corn GP**	: Dol./m.t.; Francs/dol.	: .830	.062	2.129
Kenya	: Shillings/m.t.	: 1963-74	-1.026 + 2.028 log EXR** + .717 log corn GP**	: Dol./m.t.; Shillings/dol.	: .898	.118	1.863
Pakistan	: Rupees/m.t.	: 1963-75	1.025 + .729 log EXR** + .981 log corn lag	: Dol./m.t.; Rupees/dol.	: .948	.115	1.923
Philippines	: Pesos/m.t.	: 1963-74	6.296 + .988 log EXR** + 623 log corn GP**	: Dol./m.t.; Pesos/dol.	: .901	.135	1.999
Rwanda	: \$Rwanda/m.t.	: 1963-75	1.368 + .826 log EXR** + .820 log corn GP**	: Dol./m.t.; Rwanda/dol.	: .872	.129	2.067
Spain	: Pesetas/m.t.	: 1963-75	1.448 + 1.076 log corn GP** + .684 log corn GP	: Dol./m.t.; Pesetas/dol.	: .933	.052	2.517
Yugoslavia	: Dinars/m.t.	: 1966-75	1.033 + .990 log EXR** + .804 log corn GP lag*	: Dinars/m.t.; dinars/dol.	: .966	.088	2.260
Zaire	: Zaire/m.t.	: 1966-75	2.912 + .459 log EXR** + .896 log corn GP**	: Zaire/m.t.; Zaire/dol.	: .896	.132	1.350

Countries with highly related prices				Countries with intermediately related prices				Countries with not highly related prices			
Country	Exchange	Price		Exchange	Price			Exchange	Price		
	rate	coef-		rate	coef-			rate	coef-		
	ficient	ficient		ficient	ficient			ficient	ficient		
	signifi-	signifi-	Country	signifi-	signifi-	Country		signifi-	signifi-	Country	
	cantly	cantly		cantly	cantly			cantly	cantly		
	different	different		different	different			different	different		
	from 0	from 0		from 0	from 0			from 0	from 0		
Australia	X	X	Australia	X		Austria					
Argentina	X	X	Congo			Czechoslovakia					
Bolivia	X	X	France	X	X	El Salvador					
Brazil		X	Gabon			Hungary				X	
Canada		X	Italy		X	Iraq					
Chad	X	X	Mexico			Malawi		X		X	
Chile	X	X	Morocco	X	X	Netherlands			X		
Colombia	X	X	Niger		X	New Zealand			X		
Costa Rica	X	X	Nigeria			Rhodesia					
Dominican Republic	1/	X	Portugal		X	Trinidad					
Egypt		X	Paraguay			Uganda					
Greece		X	Reunion			Upper Volta					
Guayana	X	X	Sierra Leone		X	West Germany					
India		X	Switzerland								
Korea	X	X	Kenya	x	x						
Pakistan	X	X									
Philippines	X	X									
Rwanda	X	X									
Spain	X	X									
Sri Lanka	X	X									
South Africa		X									
Switzerland		X									
Tanzania	1/	X									
Thailand	X	X									
Turkey		X									
Venezuela	X	X									
Yugoslavia	X	X									
Zaire	X	X									
Zambia											

1/No change in exchange rate.

Table 4--Highest calculated R^2 from selected models for wheat, corn, and soybeans

Country	:Wheat	: Corn	:Soybeans:	Country	:Wheat	: Corn	:Soybeans
:	:	:	:	:	:	:	:
Algeria	: .880	---	---	Korea	: .976	.917	.810
Argentina	: .994	.960	---	Malaysian Peninsula:	---	.418	.952
Australia	: .970	.786	---	Malawi	: ---	.633	---
Austria	: .904	.738	---	Mexico	: .975	.905	.963
Belgium	: .888	---	---	Morocco	: ---	.862	---
:	:	:	:	:	:	:	:
Bolivia	: .974	.986	---	Netherlands	: .856	.657	---
Brazil	: .997	.969	.994	New Zealand	: .771	.685	---
Canada	: .920	.923	.984	Niger	: .788	.901	---
Chad	: .956	.972	---	Nigeria	: ---	.814	.983
Chile	: ---	.993	---	Norway	: .975	---	---
:	:	:	:	:	:	:	:
Colombia	: .947	.916	.977	Pakistan	: .823	.948	---
Congo	: ---	.804	---	Paraguay	: .953	.819	.964
Costa Rica	: ---	.905	---	Philippines	: ---	.901	.975
Cyprus	: .893	---	---	Portugal	: .893	.862	---
Denmark	: .886	---	---	Rwanda	: .848	.872	.736
:	:	:	:	:	:	:	:
Ecuador	: .909	---	.927	Sierra Leone	: ---	.880	---
Egypt	: .856	.941	---	Spain	: .963	.933	---
El Salvador	: ---	.921	---	South Africa	: .985	.954	---
France	: .930	.827	---	Sri Lanka	: ---	---	.900
Gabon	: ---	.863	---	Sweden	: .806	---	---
:	:	:	:	:	:	:	:
West Germany:	.468	.758	---	Switzerland	: ---	.919	---
Greece	: .929	.964	---	Tanzania	: ---	.914	---
Guatemala	: .954	.756	---	Thailand	: ---	.945	.839
India	: .919	.924	---	Turkey	: .958	.951	---
Indonesia	: ---	.850	.968	Uganda	: ---	.804	---
:	:	:	:	:	:	:	:
Ireland	: .861	---	---	Upper Volta	: ---	.530	---
Israel	: .981	---	---	United Kingdom	: .938	---	---
Italy	: .944	.904	.967	Uruguay	: .984	---	---
Japan	: .974	---	.931	Venezuela	: ---	.973	---
Kenya	: .969	.898	---	Yugoslavia	: .951	.966	.967
:	:	:	:	Zaire	: ---	.896	.975
:	:	:	:	Zambia	: ---	.926	---
:	:	:	:	:	:	:	:

Table 5---Corn: Characteristics of price relations for countries whose internal farm prices are highly related to Gulf Ports price 1/

Country	Linear function		Logarithmic function		Exchange rate changed
	Gulf Port	price coef-	Gulf Port	price coef-	
	price coef-	price coef-	Exchange rate	Gulf Port	rate changed
	ficient not	ficient in	coefficient	price coef-	10 percent
	significantly	country cur-	not signifi-	ficient not	or less
	different from	rency not	cantly dif-	significantly	over
	exchange rate	significantly	ferent from 1	different from	years
	in model 1	different from	in model 5	1 in model 5	studied
	:	:	:	:	:
	:	:	:	:	:
Australia				X	
Argentina				X	
Bolivia		X			
Brazil			X		
Canada	X		X		X
Chad	X			X	X
Chile		X	X		
Colombia		X	X		
Costa Rica		X	X		
Dominican Republic	X				X
Egypt	X				X
Guayana	X		X		
India				X	
Israel					
Korea		X			
Pakistan				X	
Philippines				X	
Rwanda				X	
Spain		X			
Sri Lanka			X		
South Africa					X
Switzerland	X				
Tanzania				X	X
Thailand				X	X
Turkey				X	
Venezuela	X				X
Yugoslavia		X			
Zaire					
Zambia				X	

2

1/R for equation = .90 - 1.00.

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$$\frac{1/R}{2} \text{ for equation } = .80 - .90.$$

Table 7--Characteristics of price relations for countries whose internal farm prices are not highly related to Gulf Ports price 3/

Country	Linear function			Logarithmic function			Exchange rate
	Gulf Port price co- efficient not signi- ficantly different from exchange rate in model 1	Gulf Port price co- efficient in Country Currency not signi- ficantly different from 1 in model 2	Exchange rate coeffi- cient not signifi- cantly different from 1 in model 5	Gulf Port price co- efficient not signifi- cantly different from 1 in model 5	Exchange rate change given in Table 1 10 percent or less over years studied		
Austria			x				
Czechoslovakia					x		
El Salvador							
Hungary							
Iraq							
Malawi			x		x		
Netherlands							
New Zealand			x				
Rhodesia							
Trinidad							
Uganda			x				
Upper Volta							
West Germany							

3/ R^2 for equation < .80.

Table 8--Calculated price and exchange rate transmission elasticities
from model 5 for wheat, corn, and soybeans

Country	Wheat			Corn			Soybeans		
	Price	Exchange	rate	Price	Exchange	rate	Price	Exchange	rate
	:transmission:	:transmission:	:transmission:	:transmission:	:transmission:	:transmission:	:transmission:	:transmission:	:transmission:
	: elasticity :	: elasticity :	: elasticity :	: elasticity :	: elasticity :	: elasticity :	: elasticity :	: elasticity :	: elasticity :
Algeria	.166	.183	---	---	---	---	---	---	---
Argentina	1.014	.361	1.115	.453	.429	.491			
Australia	.902	.376	.955	1.643	---	---			
Austria	.158	.196	.025	.238	---	---			
Belgium	.068	.366	---	---	---	---			
Bolivia	.848	1.465	.205	.604	---	---			
Brazil	.199	.932	1.101	.782	1.105	.7340			
Canada	1.109	.298	.938	.603	1.796	1.435			
Chad	.912	1.355	1.160	.862	---	---			
Chile	---	---	.594	1.001	---	---			
Colombia	.530	.919	.626	.811	.380	1.077			
Congo	---	---	.526	.681	---	---			
Costa Rica	---	---	2.477	.485	---	---			
Cyprus	.068	.298	---	---	---	---			
Denmark	.088	1.330	---	---	---	---			
Ecuador	.628	1/	---	---	1.157	1/			
Egypt	.262	.724	.513	.055	---	---			
El Salvador	---	---	.015	1/	---	---			
France	.166	.011	.520	.735	---	---			
Gabon	---	---	.285	.352	---	---			
West Germany	.140	.265	.043	.302	---	---			
Greece	.516	1/	.589	1/	---	---			
Guatemala	.410	1/	.469	1/	---	---			
India	.735	2.066	.822	.305	---	---			
Indonesia	---	---	.434	1.367	.495	1.553			
Ireland	.511	1.262	---	---	---	---			
Israel	.686	1.119	---	---	---	---			
Italy	.484	1.638	.674	1.255	.539	1.024			
Japan	.329	.010	---	---	.885	1.484			

Table 8--Calculated price and exchange rate transmission elasticities
from model 5 for wheat, corn, and soybeans--Continued

Country	Wheat			Corn			Soybeans		
	Price	Exchange rate	elasticity	Price	Exchange rate	elasticity	Price	Exchange rate	elasticity
Kenya	.566	2.657		.717	2.028		---	---	---
Korea	.615	1.348		.682	.761		.348	2.671	
Malaysian Peninsula	.161	.991		.290	1.031		.437	1.106	
Malawi	.131	.336		.339	1.121		---	---	
Mexico	.541	1/		.758	1/		.753	1/	
Morocco	---	---		1.272	2.802		---	---	
Netherlands	.108	.722		.132	.045		---	---	
New Zealand	.383	.179		.678	.279		---	---	
Niger	.128	1.170		1.009	1.107		---	---	
Nigeria	---	---		.531	.995		1.070	.173	
Norway	.116	.021		---	---		---	---	
Pakistan	.186	.229		.981	.729		---	---	
Paraguay	.810	1/		.825	1/		.991	1/	
Philippines	---	---		.623	.988		.055	1.547	
Portugal	.218	.382		.687	.547		---	---	
Rwanda	.289	.525		.826	.820		.345	.038	
Sierra Leone	---	---		.359	.209		---	---	
Spain	.379	.504		.715	1.206		---	---	
South Africa	.309	.623		.426	.054		---	---	
Sri Lanka	---	---		---	---		.536	2.624	
Sweden	.268	.447		---	---		---	---	
Switzerland	---	---		.341	.289		---	---	
Tanzania	---	---		1.020	1/		---	---	
Thailand	---	---		.722	1/		.572	1/	
Turkey	.865	.563		.861	.283		---	---	
Uganda	---	---		1.039	1/		---	---	
Upper Volta	---	---		.083	.419		---	---	
United Kingdom	.673	1.332		---	---		---	---	

Table 8--Calculated price and exchange rate transmission elasticities
from model 5 for wheat, corn, and soybeans--Continued

Country	Wheat			Corn			Soybeans		
	Price	Exchange	rate	Price	Exchange	rate	Price	Exchange	rate
	:transmission:	rate	:transmission:	:transmission:	rate	:transmission:	:transmission:	rate	:transmission:
	: elasticity	:transmission:	: elasticity	: elasticity	:transmission:	: elasticity	: elasticity	:transmission:	: elasticity
Uruguay	: 1.349	.955		.470	1.102	---	---	---	---
Venezuela	: ---	---		.578	1.994	---	---	---	---
Yugoslavia	: .426	1.382		.804	.990	1.024	.538		
Zaire	: ---	---		.896	.459	.788	.096		
Zambia	: ---	---		.413	.441	---	---	---	---
	: :								

1/No change in exchange rates.

Table 9--Internal price policies for corn in selected countries

Country	Item
Argentina	:The government fixes annually producer prices for each grain. The government through its trading agency "Junta Nacional de Granos," buys all grain offered to it at the support prices set for each grain. Exports are subject to variation in exchange rates and export taxes. Has export duty for corn of 31 percent.
Australia	:There is no price support or guarantee price for corn.
Austria	:There is a minimum ex-farm price for feed corn including a value added tax. No government supports are paid for corn.
Canada	:Production and marketing of corn is uncontrolled and operated in a free market atmosphere which is strongly influenced by U.S. prices.
Colombia	:Has no subsidies or other price support program for corn.
Costa Rica	:Fixes guaranteed producer prices and purchases.
Chile	:Corn prices are established in free market.
Dominican Republic	:Government guarantees price for delivered corn.
Guyana	:Marketing board gives minimum price guarantee for maize.
India	:Has producer support guaranteed price for corn. Government is largest single buyer.
Kenya	:The government guarantees prices for corn.
Korea	:Imports are subject to tariffs. At peak supply seasons, the government purchases at preannounced fixed prices.
Mexico	:Floor prices are guaranteed by the Federal Government, made effective through procurement centers and storage facilities. Prices paid by mills and feed compounders are subsidized by government.

Table 9--Internal price policies for corn
in selected countries--Continued

Country	Item
Philippines	:Price supports for corn. The Rice and Corn Administration is required by law to buy maize directly from producers. Imported corn price the same as resale price for domestic feed grains.
South Africa	:Domestic production prices are fixed by the South African Maize Board.
Portugal	:Price to mills, compounders fixed for both domestic and imported supplies. They are fixed for the season by decree.
Sri Lanka	:Imports of grain made by a government monopoly.
Thailand	:Exports are under a general policy to facilitate the expansion of the export trade. Use export quotas with prices determined by U.S. prices. Minimum price guarantee scheme is in operational only if prices of major crops are expected to fall too low. At present, has no operational price support or guarantee prices for corn.
Switzerland	:Has a set target price. Has combination of tight feedstuff import quota with protectionist level of levy.
Turkey	:There is no support price for corn and corn is traded in a free market.
Venezuela	:Guaranteed prices for all cereals, reviewed annually.

Source: Food and Agriculture Organization of the United Nations, National Grain Policies.

Table 10--The world's principal corn producing, exporting, and importing countries

Country	Principal : producers :		Country		Principal : exporters :		Country		Principal : importers :	
	: share of :	: total :	: share of :	: total :	: share of :	: total :	: share of :	: total :	: share of :	: total :
U. S.	:	46	:	:	:	71	:	USSR	:	16
PRC	:	16	:	:	:	8	:	Japan	:	15
Brazil	:	5	:	:	:	4	:	Italy	:	7
USSR	:	3	:	:	:	3	:	Netherlands	:	7
South Africa	:	3	:	:	:	3	:	Spain	:	6
Mexico	:	3	:	:	:	2	:	United Kingdom	:	6
Yugoslavia	:	3	:	:	:	1	:	West Germany	:	6
Romania	:	3	:	:	:	1	:	Belgium-Luxemburg:	:	4
France	:	2	:	:	:	1	:	Taiwan	:	3
Argentina	:	2	:	:	:	1	:	East Germany	:	3
	:	:	:	:	:	:	:	:	:	:

SOURCE: Based on 1975-77, FAS grains data base. Exports and imports are gross figures.

Table 11--Principal wheat producing,
exporting and importing countries 1/

Country	: World :production:	: Country :	: World :exports	: Country :	: World :imports
USSR	: 28	:U.S.	: 41	:China	: 12
U.S.	: 11	:Canada	: 18	:Japan	: 7
China	: 9	:France	: 10	:USSR	: 7
India	: 7	:Australia	: 9	:Brazil	: 5
Canada	: 5	:Argentina	: 4	:Egypt	: 5
Australia	: 4	:Romania	: 2	:U. K.	: 4
France	: 4	:Turkey	: 1	:Italy	: 3
Turkey	: 3	:Hungary	: 1	:Poland	: 3
Yugoslavia	: 3	:Sweden	: 1	:Korea	: 2
Pakistan	: 2	:West Germany	: 1	:Pakistan	: 1

1/Data based on 1975-77 Foreign Agricultural Service grains data base.
Exports and imports are gross figures and may include re-exports.

Country	Unit of dependent	Time period	Equation	Unit of independent variables	R corrected for degrees of freedom	Standard error of regression	Durbin Watson test
Model 1							
Algeria	:Dinars/m.t.	:1966-74	434.354 + .946 wheat GP lag**	:Dol./M.T.	.880	9.327	1.999
Australia	:Cents/m.t.	:1966-76	1869.92 + 56.346 wheat GP**	:Dol./M.T.	.970	460.309	2.655
Canada	:Cents/m.t.	:1961-74	826.378 + 106.50 wheat GP**	:Dol./M.T.	.920	1093.67	2.112
Cyprus	:Mil. m.t.	:1966-75	33858.4 + 140.82 wheat GP lag**	:Dol./M.T.	.893	2345.28	2.184
Denmark	:Dre/m.t.	:1966-75	34751.3 + 308.81 wheat GP**	:Dol./M.T.	.886	5226.62	1.546
Egypt	:Millime/m.t.	:1966-75	26986.8 + 138.615 wheat GP lag**	:Dol./M.T.	.856	2441.77	1.905
El Salvador	:Colon/m.t.	:1966-75	175.553 + .877 wheat GP lag**	:Dol./M.T.	.921	13.706	1.763
France	:Francs/100 kg.	:1966-75	48.631 + 3.481 wheat GP lag**	:Dol./M.T.	.930	1.843	1.931
Greece	:Drachma/m.t.	:1961-74	1708.44 + 17.225 wheat GP**	:Dol./M.T.	.929	195.493	1.961
Guatemala	:Quetzal/m.t.	:1961-74	85.060 + .657 wheat GP lag**	:Dol./M.T.	.954	3.115	2.185
West Germany	:Marks/m.t.	:1961-74	385.163 + .243 wheat GP**	:Dol./M.T.	.468	13.242	2.216
India	:Rupees/m.t.	:1966-75	504.563 + 5.536 wheat GP lag**	:Dol./M.T.	.919	69.539	1.770
Mexico	:Pesos/m.t.	:1961-74	475.628 + 6.313 wheat GP lag**	:Dol./M.T.	.964	25.270	1.601
Niger	:Francs/m.t.	:1966-74	24.985.0 + 167.78 wheat GP**	:Dol./M.T.	.788	3921.77	1.619
Norway	:Krone/m.t.	:1961-75	11.59.90 + 1.510 wheat GP lag**	:Dol./M.T.	.975	7.465	1.984
Paraguay	:Guarani/m.t.	:1966-74	2371.79 + 127.39 wheat GP lag**	:Dol./M.T.	.953	457.357	2.696
Spain	:Pesetas/m.t.	:1966-76	7875.68 + 23.606 wheat GP lag	:Dol./M.T.	.963	288.171	2.524
Sweden	:Krona/m.t.	:1961-75	438.903 + 1.210 wheat GP lag**	:Dol./M.T.	.806	20.172	1.280

Table 12--Equations showing the relationship between the U.S. Gulf Ports price for wheat and internal farm prices in selected countries--Continued

Country	Unit of dependent variables	Time period	Equation	Unit of independent variables	R2 corrected for degrees of freedom	Standard error of regression	Durbin Watson test
Model 5							
Argentina	:Pesos/m.t.	:1966-75	4.139 + 1.014 log wheat GP** + .361 log EXR**	:Dol./M.T.; Pesos/dol.	:.994	.064	1.831
Austria	:Shillings/m.t.	:1961-75	7.091 + .158 log wheat GP lag** + .196 log EXR**	:Dol./M.T.; Shillings/dol.	:.904	.011	1.510
Belgium	:Francs/m.t.	:1961-75	9.870 - .366 log EXR** + .068 log wheat GP lag**	:Dol./M.T.; Francs/dol.	:.888	.022	1.965
Bolivia	:Pesos/m.t.	:1961-74	2.819 + 1.465 log EXR** + .848 log wheat GP lag**	:Dol./M.T.; Pesos/dol.	:.974	.202	2.353
Brazil	:Cruzeiros/m.t.	:1961-73	4.647 + .932 log EXR** + .199 log wheat GP**	:Dol./M.T.; Cruzeiros/dol.	:.997	.050	2.516
Chad	:Francs/m.t.	:1961-75	1.947 + 1.355 log EXR** + .912 log wheat GP**	:Dol./M.T.; Francs/dol.	:.956	.067	2.297
Colombia	:Pesos/m.t.	:1961-74	4.689 + .919 log EXR** + .530 log wheat GP lag**	:Dol./M.T.; Pesos/dol.	:.947	.107	1.726
Ireland	:New pence/m.t.	:1961-75	8.951 + .511 log wheat GP** - 1.262 log EXR**	:Dol./M.T.; New pence/dol.	:.861	.109	1.874
Israel	:Pound/m.t.	:1961-75	4.011 + .686 log wheat GP lag** + 1.119 log EXR**	:Dol./M.T.; Pound/dol.	:.981	.064	1.985
Italy	:Lire/m.t.	:1961-75	.361 + 1.638 log EXR** + .484 log wheat GP**	:Dol./M.T.; Lire/dol.	:.944	.051	1.529
Japan	:Yen/m.t.	:1961-74	11.355 + .329 log wheat GP lag** + .010 log EXR**	:Dol./M.T.; Yen/dol.	:.974	.046	1.482
Kenya	:Shillings/m.t.	:1961-77	.743 + 2.657 log EXR** + .566 log wheat GP lag**	:Dol./M.T.; Shillings/dol.	:.969	.060	1.802
Korea	:Won/m.t.	:1966-74	2.149 + 1.348 log EXR** + .615 log wheat GP lag**	:Dol./M.T.; Won/dol.	:.976	.055	1.497
Netherlands	:Guilders/m.t.	:1961-74	6.864 - .722 log EXR** - .108 log wheat GP**	:Dol./M.T.; Guilders/dol.	:.856	.027	2.001
Rwanda	:Francs/m.t.	:1961-74	6.561 + .525 log EXR** + .289 log wheat GP lag**	:Dol./M.T.; Francs/dol.	:.848	.130	2.103
South Africa	:Cents/m.t.	:1966-75	8.632 + .623 log EXR** + .309 log wheat GP lag**	:Dol./M.T.; Cents/dol.	:.985	.020	2.091
Turkey	:Lira/m.t.	:1961-74	5.096 + .563 log EXR** + .865 log wheat GP lag**	:Dol./M.T.; Lira/dol.	:.958	.059	1.970
United Kingdom	:New pence/m.t.	:1961-75	8.849 + .673 log wheat GP** - 1.332 log EXR**	:Dol./M.T.; Pence/dol.	:.938	.087	1.932
Uruguay	:Pesos/m.t.	:1961-74	9.751 + .955 log EXR** + 1.349 log wheat GP**	:Dol./M.T.; Pesos/dol.	:.984	.228	2.014
Yugoslavia	:Dinars/m.t.	:1966-75	3.140 + 1.382 log EXR** + .426 log wheat GP lag**	:Dol./M.T.; Dinars/dol.	:.951	.075	2.072

Table 13--Wheat: Characteristics of price and exchange rate coefficients in double logarithmic relationship from Model 5

Country	Countries with highly related prices					Countries with intermediately related prices					Countries with no highly related prices				
	: Exchange : : rate coef- : : ficient : : signifi- : : cantly : : different : : from 0 :	Price coef- ficient signifi- cantly different from 0	: : : : : : :	Country	: : : : : : :	: Exchange : : rate coef- : : ficient : : signifi- : : cantly : : different : : from 0 :	Price coef- ficient signifi- cantly different from 0	: : : : : : :	Country	: : : : : : :	: Exchange : : rate coef- : : ficient : : signifi- : : cantly : : different : : from 0 :	Price coef- ficient signifi- cantly different from 0	: : : : : : :	Country	: : : : : : :
Argentina	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
Australia	:	X	:	:Algeria	:	:	:	:	:West Germany	:	:	:	:	:	X
Austria	:	X	:	:Belgium	:	:	:	:	:Niger	:	:	:	:	:	:
Bolivia	:	X	:	:Cyprus	:	:	:	:	:	:	:	:	:	:	:
Brazil	:	X	:	:Egypt	:	:	:	:	:	:	:	:	:	:	:
Canada	:	X	:	:Netherlands	:	:	:	:	:	:	:	:	:	:	:
Chad	:	X	:	:Portugal	:	:	:	:	:	:	:	:	:	:	:
Colombia	:	X	:	:Rwanda	:	:	:	:	:	:	:	:	:	:	:
El Salvador	:	X	:	:Sweden	:	:	:	:	:	:	:	:	:	:	:
France	:	X	:	:U. K.	:	:	:	:	:	:	:	:	:	:	:
Guatemala	:	X	:	:	:	:	:	:	:	:	:	:	:	:	:
India	:	1/	:	:	:	:	:	:	:	:	:	:	:	:	:
Greece	:	X	:	:	:	:	:	:	:	:	:	:	:	:	:
Israel	:	X	:	:	:	:	:	:	:	:	:	:	:	:	:
Italy	:	X	:	:	:	:	:	:	:	:	:	:	:	:	:
Japan	:	X	:	:	:	:	:	:	:	:	:	:	:	:	:
Kenya	:	X	:	:	:	:	:	:	:	:	:	:	:	:	:
Korea	:	X	:	:	:	:	:	:	:	:	:	:	:	:	:
Mexico	:	1/	:	:	:	:	:	:	:	:	:	:	:	:	:
Norway	:	X	:	:	:	:	:	:	:	:	:	:	:	:	:
Paraguay	:	1/	:	:	:	:	:	:	:	:	:	:	:	:	:
South Africa	:	X	:	:	:	:	:	:	:	:	:	:	:	:	:
Spain	:	X	:	:	:	:	:	:	:	:	:	:	:	:	:
Turkey	:	X	:	:	:	:	:	:	:	:	:	:	:	:	:
U. K.	:	X	:	:	:	:	:	:	:	:	:	:	:	:	:
Uruguay	:	X	:	:	:	:	:	:	:	:	:	:	:	:	:
Yugoslavia	:	X	:	:	:	:	:	:	:	:	:	:	:	:	:

1/No change in exchange rate.

1/ Level of significance of .05 used for tests. For all countries $80 < R \leq .90$.

Table 16--Wh

 $\frac{1}{2}$

1/

Country	Unit of dependent variable	Time period	Equation	Unit of independent variable	R corrected: for degrees of freedom	Standard error of regression	Durbin Watson test
Model 1							
Ecuador	:Escudos/m.t.	:1966-74	-575.116 + 36.292 soy GP lag*	:Dol./m.t.	:.928	578.436	2.180
El Salvador	:Colones/m.t.	:1966-75	206.412 + .991 soy GP lag**	:Dol./m.t.	:.866	25.957	1.911
Korea	:Won/m.t.	:1966-74	101221 + 206.421 soy GP lag**	:Dol./m.t.	:.810	14579.5	1.891
Laos	:KIP/m.t.	:1966-73	21280.4 + 407.263 soy GP**	:Dol./bu.	:.891	8642.50	1.045
Malaysian Peninsula	:Dol.Mal./m.t.	:1966-74	830.04 + 2.483 soy GP lag**	:Dol./m.t.	:.952	50.741	1.614
Mexico	:Pesos/m.t.	:1961-74	351.593 + 10.909 soy GP**	:Dol./m.t.	:.927	182.210	1.730
Nigeria	:Nair/m.t.	:1966-74	-1.462 + .370 soy GP lag**	:Dol./m.t.	:.983	2.787	2.546
Paraguay	:Guaranies/m.t.	:1966-74	161.658 + 78.389 soy GP**	:Dol./m.t.	:.964	879.855	2.571
Rwanda	:\$Rhod/m.t.	:1966-74	10044.7 + 29.126 soy GP lag*	:Dol./m.t.	:.736	1124.04	1.783
Thailand	:Baht/m.t.	:1966-74	1567.28 + 7.851 soy GP**	:Dol./m.t.	:.839	245.978	2.248
Zaire	:Zaire/m.t.	:1966-74	3.673 + 3.373 soy GP**	:Dol./m.t.	:.975	1.058	1.198
Model 5							
Brazil	:Cruzeiros/m.t.	:1965-73	-.505 + .734 log EXR** + 1.105 log soy GP**	:Dol./m.t.	:.994	.049	2.747
Canada	:Can. cents/m.t.	:1966-74	5.563 - 1.435 log EXR** + 1.796 log soy GP**	:Dol./m.t.	:.984	.048	2.258
Colombia	:Pesos/m.t.	:1961-74	3.004 + 1.077 log EXR** + .380 log soy GP lag**	:Dol./m.t.	:.977	.082	1.846
Indonesia	:Rupiahs/m.t.	:1966-74	-.735 + 1.533 log EXR** + .495 log soy GP**	:Dol./m.t.	:.966	.133	2.601
Italy	:Lire/m.t.	:1966-75	1.954 + 1.024 log EXR** + .539 log soy GP**	:Dol./m.t.	:.967	.062	1.768
Japan	:Yen/m.t.	:1961-74	-1.075 + 1.484 log EXR** + .885 log soy GP**	:Dol./m.t.	:.931	.096	2.146
Sri Lanka	:Rupees/m.t.	:1966-74	1.368 + 2.624 log EXR** + .536 log soy GP lag**	:Dol./m.t.	:.900	.209	2.668
Yugoslavia	:Dinars/m.t.	:1966-75	1.953 + 1.024 log soy GP lag** + .538 log EXR**	:Dol./m.t.	:.967	.061	1.767

Table 18--Soybeans: Tests of prices and exchange rates
for complete insulation 1/

Country	: Exchange rate coef- : ficient significantly : different from 0	: Price coefficient : significantly : different from 0
Argentina	:	:
Brazil	: X	X
Canada	: X	X
Colombia	: X	X
Ecuador	:	X
El Salvador	: <u>2/</u>	X
Indonesia	: X	X
Italy	:	X
Japan	: X	X
Korea	: X	:
Laos	:	X
Malaysian Peninsula	: X	X
Mexico	: <u>2/</u>	X
Nigeria	:	X
Paraguay	: <u>2/</u>	X
Philippines	: X	X
Rwanda	:	X
Sri Lanka	: X	X
Thailand	: X	X
Yugoslavia	: X	X
Zaire	:	X
	:	:

1/Model 5, the double log relationship was used for all countries.
Significance level of .05 used as total criteria.

2/Exchange rate changed 10 percent or less during years studied.

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